Installation of Bi-Fold Covers on Process Tanks in the Cleaning Room Facility at the NADEP NAS North Island, San Diego

Presented by: Terry Hutchins
Sales & Marketing Manager
Equipment Division
Palm International, Incorporated

Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
25 FEB 2004	**N/A**	**-**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Installation of Bi-Fold Covers on Process Tanks in the Cleaning Room Facility at the NADEP NAS North Island, San Diego	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **Palm International, Incorporated**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release, distribution unlimited

13. SUPPLEMENTARY NOTES
See also ADM001865, Industrial Process and Energy Optimization. Proceedings of the Industry Workshop Held in Gettysburg, PA, 25-27 February 2004., The original document contains color images.

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**UU**	**22**	

The NADEP's Cleaning Room Facility

The NADEP facility located on the NAS North Island, San Diego, CA currently has twenty-eight (28) exhausted process and heated rinse tanks in operation in the Cleaning Room facility.

The NADEP's Current Air Pollution Control Devices

The NADEP currently incorporates a total of eight 30,000 CFM Mist Eliminator Exhaust Systems, each driven by a 30 HP motor as its add-on control device. Each exhaust fan motor is operated 24 hours per day 7 days per week at an average cost of 10.7 cents per kilowatt hour.

BI-FOLD TANK COVERS

This presentation addresses the installation of bi-fold covers on the NADEP's cleaning room process and heated rinse tanks to reduce annual operating costs and provide enhanced operator safety and exposure to fumes in the cleaning room facility.

BI-FOLD TANK COVERS

Tank Covers

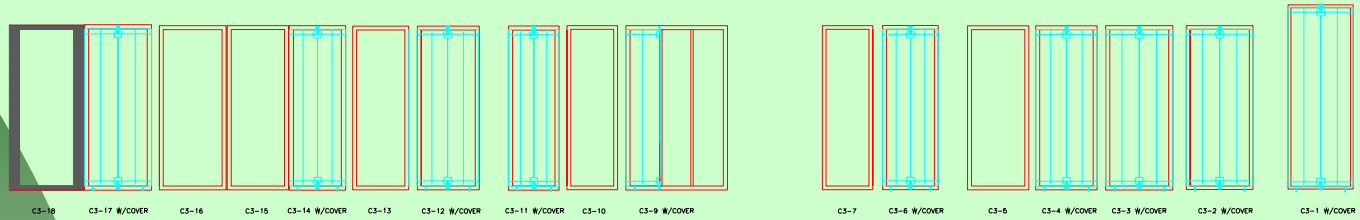
The following tanks are currently exhausted and are candidates for bi-fold tank covers:

Line C1: C1-1, C1-2, C1-3, C1-4, C1-5, C1-6, C1-7, C1-8, C1-9, C1-10, C1-11, C1-12, C1-13
Line C2: C2- 1, C2-3, C2-6, C2-8, C2-9
Line C3: C3-1, C3-2, C3-3, C3-4, C3-6, C3-9C, C3-11, C3-12, C3-14, C3-15, C3-17

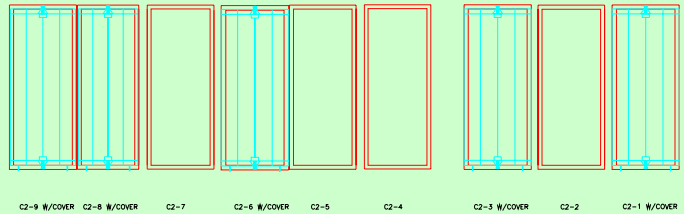
The tank covers for process tanks will be fabricated from T-316 stainless steel materials and T-304 stainless steel for rinse tanks. Covers on tanks heated to 150^{o}F or greater will the insulated with 2" of fiberglass insulation material and will be totally encapsulated by stainless steel materials of construction.

CLEANING ROOM LAYOUT

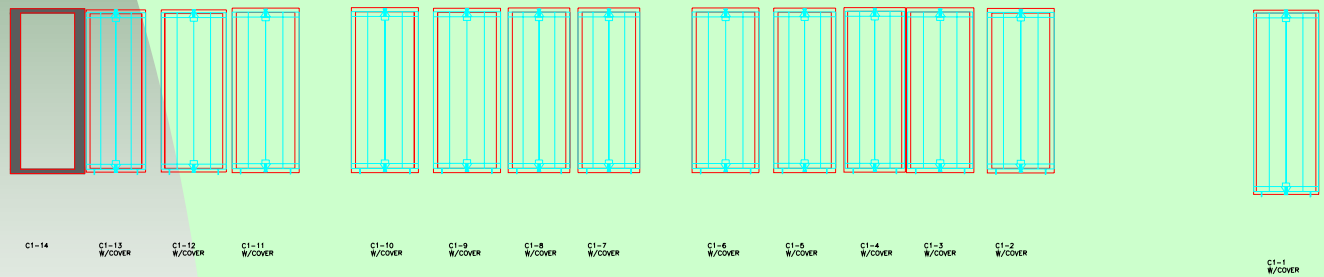
TWO CRANES OPERATE OVER THE C3 LINE. IF EACH CRANE IS IN OPERATION SIMULTANEOUSLY, TWO COVERS COULD BE OPEN AT THE SAME TIME.



ONE CRANE OPERATES OVER THE C2 LINE. ONLY ONE COVER COULD BE OPEN AT THE SAME TIME.

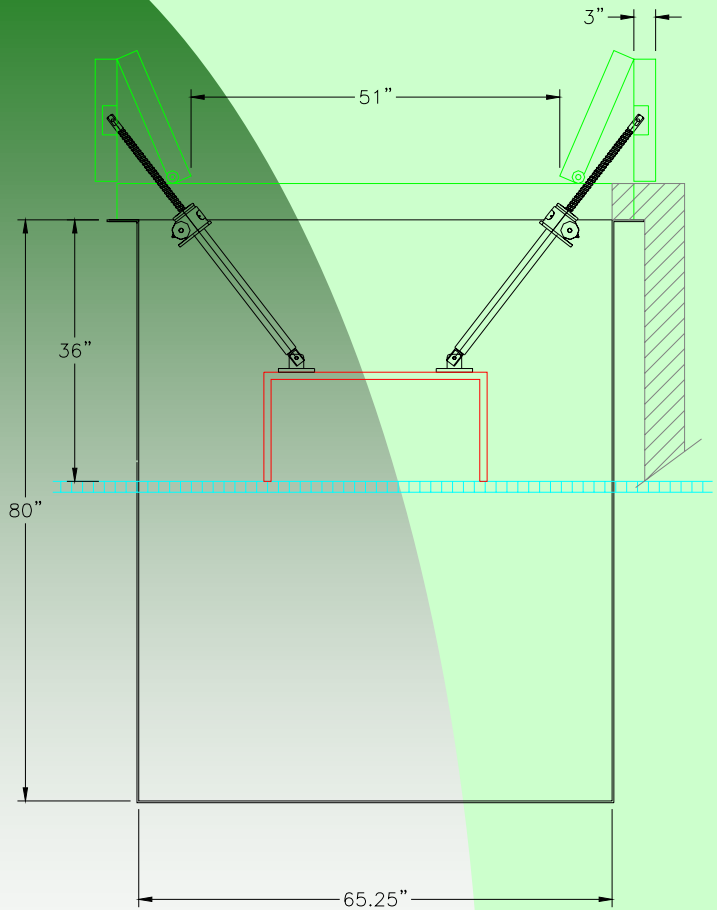


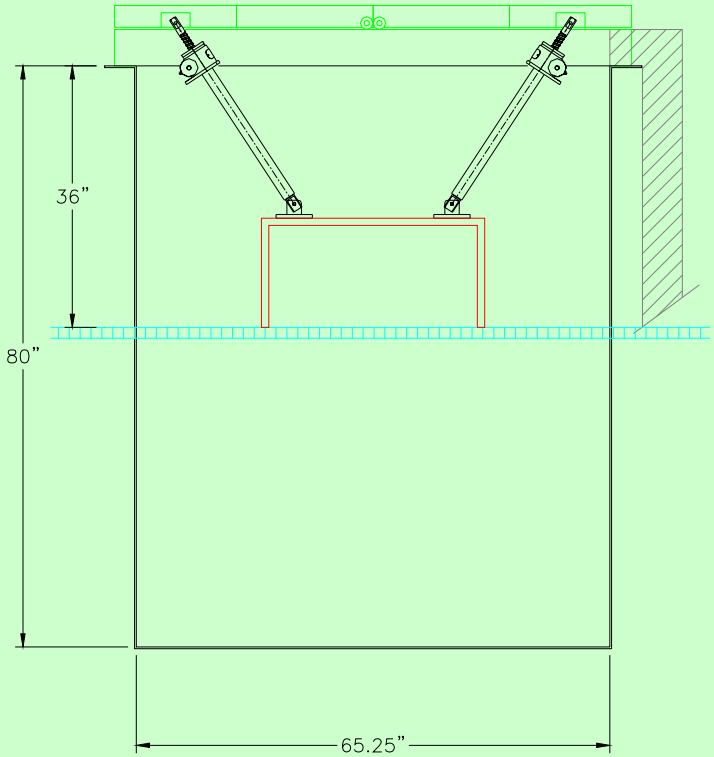
THREE CRANES OPERATE OVER THE C1 LINE. IF EACH CRANE IS IN OPERATION SIMULTANEOUSLY, THREE COVERS COULD BE OPEN AT THE SAME TIME.



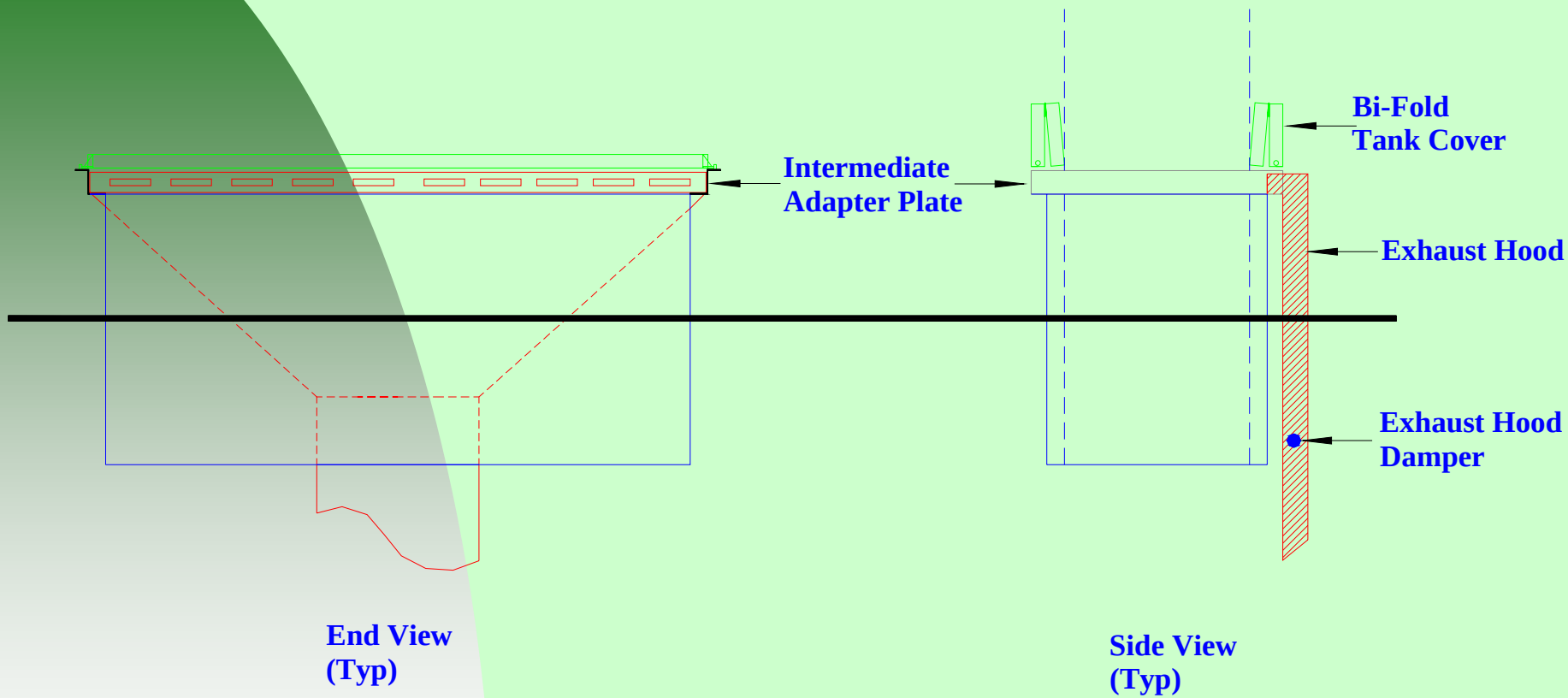
NADEP BUILDING 472 CLEANING SHOP

BI-FOLD TANK COVERS

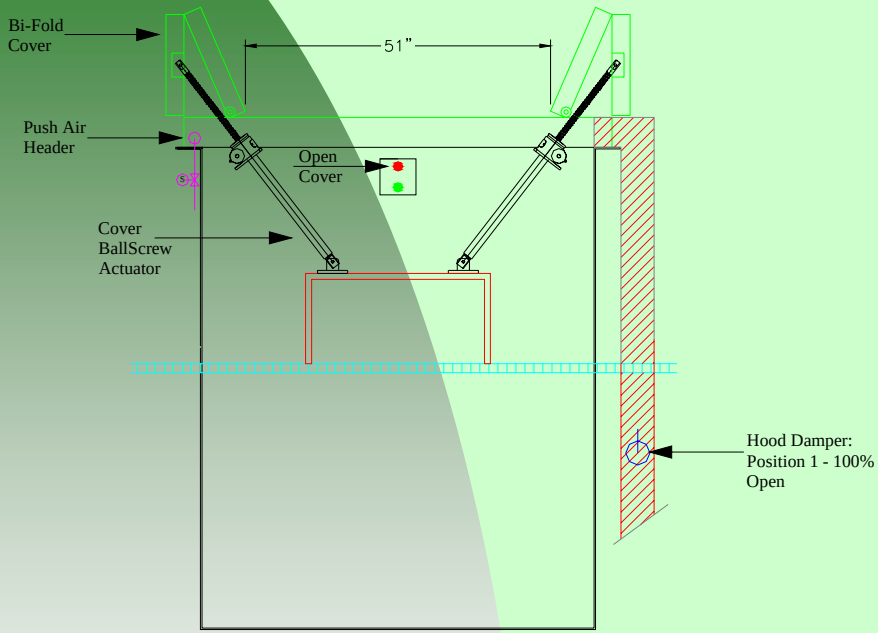


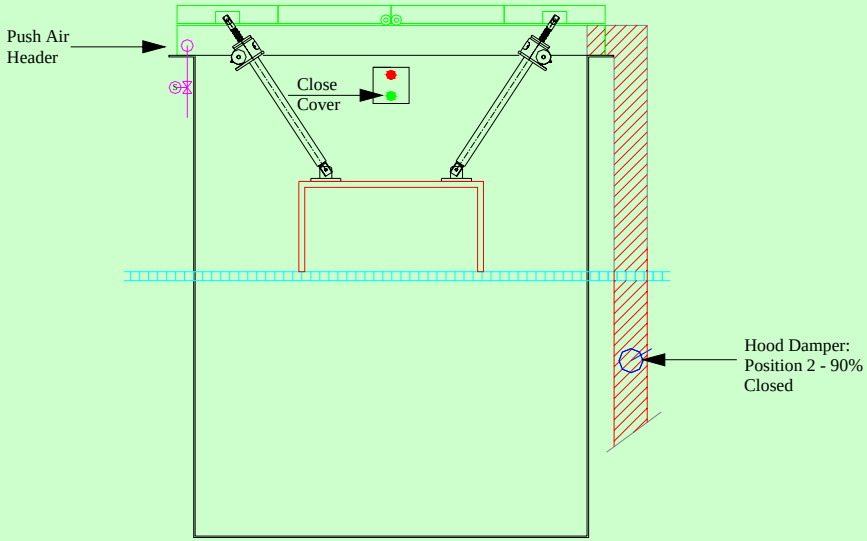


BI-FOLD TANK COVERS



THEORY OF OPERATION





THEORY OF OPERATION

Sequence of Operation:

Controller shall be three position - Idle Auto On

In the Idle position, all covers are closed and operators off. Push air blower(s) are off.

System will automatically convert from Auto to Idle if no cover has been activated within a two-hour time span.

Controller will need to be manually reset to Auto position, push air blower(s) will activate, and cover operators will be powered.

If controller is manually reset to On position, push air blower will remain on and cover actuators will remain powered.

Each tank will have a two-button cover operator controller. When the "open" button is pushed, the hood exhaust damper will open to maximum open position position, the push air feed solenoid will open approximately (10) seconds later, and approximately (5) seconds later, the cover will open.

When the "close" cover button is pushed, the cover will close, the push air feed solenoid will close, and the hood damper will close to the (90%) closed position.

The motorized by-pass exhaust air damper in the basement will be adjusted to maintain a constant velocity through the mist eliminator, fan, and exit stack.

THEORY OF OPERATION

Exhaust System C5 is designed to evacuate a total of 30,000 CFM. The simplest method of operation will be to equalize the evacuation CFM over all tanks in this system as shown below. A total of 10,000 CFM will come from the tankline with all covers closed, 20,000 CFM from the basement.

TANK NO.	EXISTING CFM (FROM NADEP)	ONE COVER OPEN		TWO COVERS OPEN		THREE COVERS OPEN	
C1-1	9100	7,435.9		7,435.9		7,435.9	
C1-2	5600		769.2		769.2		769.2
C1-3	5900		769.2		769.2		769.2
C1-4	5350		769.2		769.2		769.2
C1-5	5900		769.2		769.2		769.2
C1-6	7200		769.2	7,435.9		7,435.9	
C1-7	5350		769.2		769.2		769.2
C1-8	5350		769.2		769.2		769.2
C1-9	5900		769.2		769.2		769.2
C1-10	5900		769.2		769.2		769.2
C1-11	5900		769.2		769.2	7,435.9	
C1-12	5900		769.2		769.2		769.2
C1-13	5350		769.2		769.2		769.2
		7,435.9	9,230.7	14,871.8	8,461.4	22,307.7	7,692.2
Exhaust from Tankline			16,667		23,333		30,000
Exhaust from Basement		30,000	13,333	30,000	6,667	30,000	0

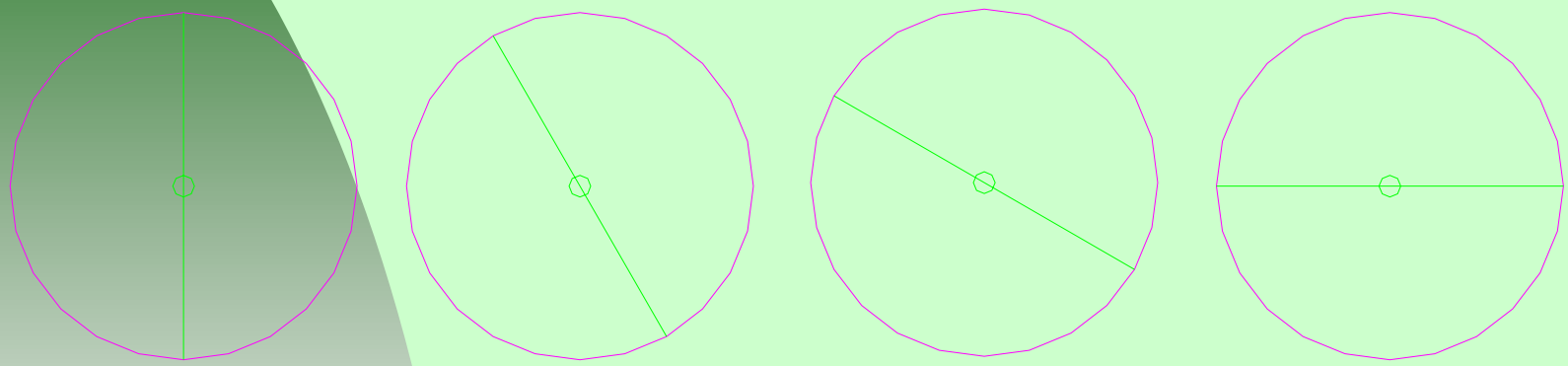
THEORY OF OPERATION

Exhaust System C1 is designed to evacuate a total of 30,000 CFM. The simplest method of operation will be to equalize the evacuation CFM over all tanks in this system as shown below. A total of 10,000 CFM will come from the tankline with all covers closed, 20,000 CFM from the basement.

TANK NO.	EXISTING CFM (FROM NADEP)	ONE COVER OPEN		TWO COVERS OPEN		THREE COVERS OPEN	
C2-1	5850	7,333.4		7,333.4		7,333.4	
C2-3	5800		666.7		666.7		666.7
C2-6	5900		666.7		666.7		666.7
C2-8	5350		666.7		666.7		666.7
C2-9	5900		666.7	7,333.4		7,333.4	
C3-1	7200		666.7		666.7		666.7
C3-2	5900		666.7		666.7		666.7
C3-3	5900		666.7		666.7		666.7
C3-4	5350		666.7		666.7		666.7
C3-6	4800		666.7		666.7		666.7
C3-9	9500		666.7		666.7		666.7
C3-11	4250		666.7		666.7	7,333.4	
C3-12	5300		666.7		666.7		666.7
C3-14	4800		666.7		666.7		666.7
C3-17	5900		666.6		666.6		666.6
		7,333	9,334	14,667	8,667	22,000	8,000
Exhaust from Tankline			16,667		23,334		30,000
Exhaust from Basement		30,000	13,333	30,000	6,666	30,000	0

THEORY OF OPERATION

Motorized Damper Positions to adjust Basement Airflow



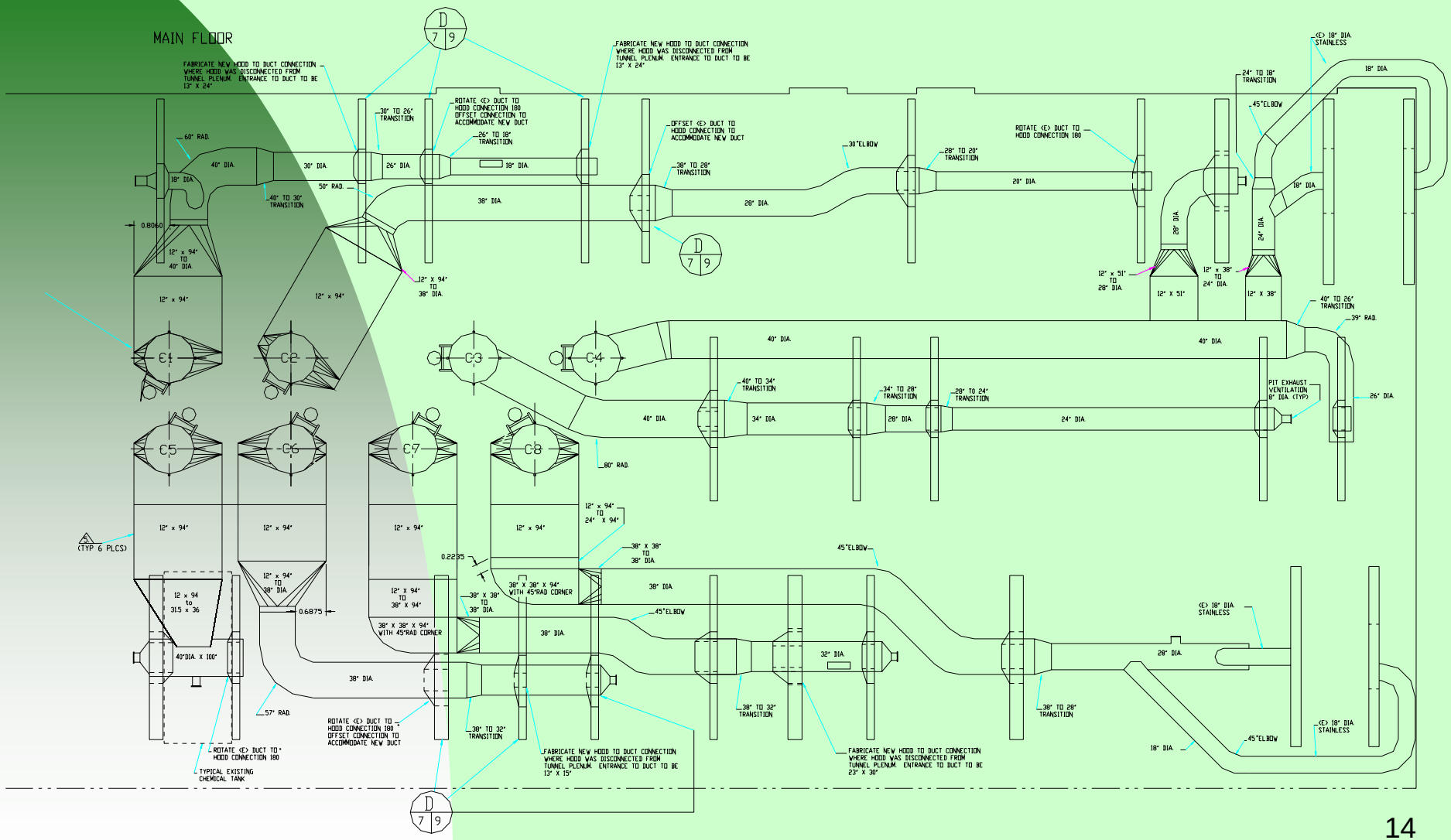
20,000 CFM From Pit
10,000 CFM from Tankline

13,333 CFM from Pit
16,667 from Tankline

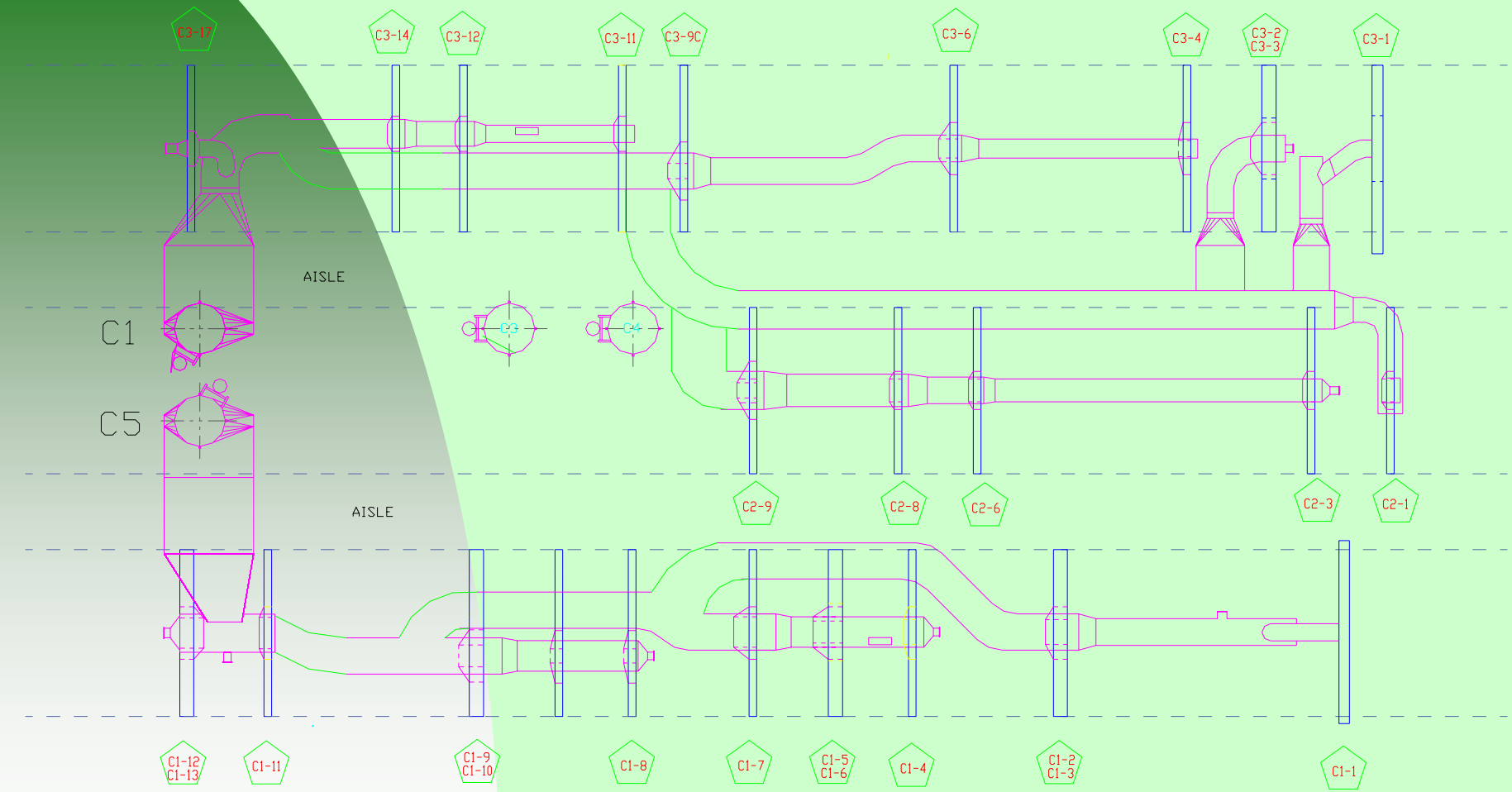
6,666 CFM from Pit
23,334 from Tankline

0 CFM from Pit
30,000 from Tankline

EXISTING BASEMENT EXHAUST DUCT



MODIFIED BASEMENT EXHAUST DUCT



RECOMMENDATIONS

Most of the tanks use a push-pull ventilation system. Convert Aqueous Degreaser tanks C1-1 and C3-1 from pull-pull exhaust to push-pull. The pull-pull power spray was (C1-6) does not need to be converted to push-pull. The only reason for ventilation of the power wash is to remove water vapor. Since a capture rate of 100 cfm per square foot of open surface is adequate, little benefit will be gained by conversation to push-pull. Additionally, the pull-pull system will better capture any mist bouncing off the parts during cleaning.

Provide new covers for all open surface tanks including replacing the Paint Stripper tank C1-4.

RECOMMENDATIONS

Provide covers and retain the current push-pull ventilation for currently empty tanks C1-12 and C2-6 to maintain future capability.

Provide an adjustable strip (plate) to reduce the exhaust hood opening, as required, to maintain a slot velocity of approximately 2000 fpm at the new maximum exhaust rate.

Maintain current combined exhaust system and single cover for tank C3-9. Separate covers may be considered but no additional ventilation savings are anticipated since the flow must be maintained through the mist eliminator.

Combine ventilation exhaust of all tanks in Line C-1 exhaust with Exhaust System C5.

RECOMMENDATIONS

Combine ventilation exhaust of all tanks in Lines C-2 and C-3 exhaust with Exhaust System C1.

Add motorized bypass dampers on the two remaining systems to ventilate the basement and maintain constant volume airflow in the two exhaust systems. This will serve the dual purpose of ventilating the basement and maintaining design flow through the mist eliminator.

Review characteristics of existing mist eliminator to determine if the optimum airflow operating range will permit further reductions in exhaust and makeup air volumes for additional savings.

RECOMMENDATIONS

Determine if makeup air should be reduced below the current estimated 96.25% of exhaust. With the reduction in volume, the negative pressure will not be as great. If make-up air rates below 96.25% of exhaust volumes are used to maintain negative pressure, additional savings will result.

Abandon in place disconnected ductwork and Exhaust Systems C2, C3, C4, C6, C7, and C8.

Reduce two make-up air-handling units from 38,500 cfm to 28,875 cfm each and operate only two reduced volume make-up air handlers, down from six.

RECOMMENDATIONS

Coordinate current project to include arrangement of piping so it can be attached and detached after covers are added.

Install out-of-tank pumps for eductor agitation in lieu of in-tank pumps to facilitate cover installation.

COST SAVINGS

Eliminating six 30 horsepower exhaust fans	$136,806.00
Reducing makeup air handlers by 40 horsepower	$ 60,804.00
Cooling of 173,250 cfm makeup air eliminated	$
Heating of 173,250 cfm makeup air eliminated	$ 99,558.00
Reduction in heat loss from covered tanks	$ 10,549.00
Maintenance of eliminated equipment	$ 5,000/00
Savings with reduction in push air blower operation	$ 38,002.00
Projected Minimum Annual Savings	$350,719.00

CONCLUSIONS

Installation of Bi-Fold Covers offers significantly reduced operating costs and enhanced operator safety and exposure. In the case of the NADEP, as shown previously, annual savings are estimated to be $350,719.00. The capital investment of approximately $1,045,000 results in a payback of approximately 3 years.